REMARKS/ARGUMENTS

STATUS OF CLAIMS

Claims 1, 3-13, 15-20, 22-29, 31-36, 38-46, 48-53, 55-72 and 103-106 are currently pending in this application. Applicants have amended Claims 1, 12-13, 15, 18, 27-29, 36, 45-46, 48, 51, 55-56, and 65-68. Applicants have added new Claims 103-106. Applicants have cancelled Claims 2, 14, 21, 30, 37, 47, 54 and 73–102. Applicants respectfully request reconsideration and allowance of pending Claims 1, 3-13, 15-20, 22-29, 31-36, 38-46, 48-53, 55-72 and 103-106.

CLAIM REJECTIONS – 35 U.S.C. §112

Dependent Claims 62 and 63

Claims 62 and 63 stand rejected under 35 U.S.C. §112, first paragraph. Applicants respectfully submit that the specification of the current application adequately describes "the first plane" and "the second plane" specified by Claims 62 and 63 to one of ordinary skill in the art. On page 9 of the Office Action, Official Notice was taken that it is well known in molecular models to have four representations which do not all lie in the same plane; thus defining two planes as specified by Claims 62 and 63. In addition, Applicants respectfully submit that Figures 11b-12b of the present application adequately illustrate the first plane and the second plane as specified by Claims 62 and 63. Therefore, based on the drawings, the description of the amino acid units in the specification, and the Official Notice taken in the Office Action, one skilled in the art would be able to make and/or use the invention as claimed in Claims 62 and 63. Accordingly, Applicants respectfully request removal of the rejection of Claims 62 and 63 under 35 U.S.C. §112, first paragraph.

Dependent Claims 65-68

Claims 65-68 stand rejected under 35 U.S.C. §112, second paragraph. Applicants have amended Claims 65-68 to remove the word "approximately." Applicants respectfully request removal of the rejection of Claims 65-68 under 35 U.S.C. §112, second paragraph.

CLAIM REJECTIONS – 35 U.S.C. §§102 and 103

Independent Claim 1

Claims 1 stands rejected under 35 U.S.C. §102(b) as being anticipated by Barnett (U.S. Patent No. 4,184,271).

Amended Claim 1 calls for, among other things:

> "...at least one of the first elongated strand and the second elongated strand including a first segment and a second segment, the first segment and the second segment adapted to be interconnected in a single orientation..." (amendment marks not shown; underlining added for emphasis).

Barnett discloses a model for representing nucleic acid molecules, such as deoxyribonucleic acid (DNA) and ribonucleic acid (RNA), which consists of a plurality of helical segments secured together in end-to-end relation in the form of one or two helixes comprising the molecular backbone. Figures 1-3 of Barnett illustrate a DNA molecular model. In the DNA molecular model shown in Figure 1, there are two separate, right-hand helixes 10 and 11 which are wound around a common axis. The helixes 10 and 11 are slightly asymmetric to define a minor helical groove *c* and a major helical groove *d* in the surface of the DNA molecule. Each of the helixes 10 and 11 is formed of a plurality of helical segments 12 having a planar side group 13 representing the purine or pyrimidine side group in the individual nucleotides which make up the helical molecule.

Figure 4 of Barnett illustrates a model of one of the nucleotide units consisting of a backbone in the form of a helical segment 12a and having a pyrimidine side group 13a formed integrally therewith, preferably of a molded plastic material. The backbone segment 12a represents the sugar-phosphate unit making up the helical backbone of the DNA molecule. For DNA, the sugar backbone is deoxyribose phosphate. For RNA, the backbone is ribose phosphate. The helical segment 12a representing the sugar-phosphate backbone unit is provided with a male prong 13a at one end and female receptor 15a at the other end. Figure 5 of Barnett illustrates a sugar-phosphate unit having a side group which is pyrimidine, thymine or uracil. The sugar phosphate backbone is represented by helical segment 12b having male prong 14b at one end and female receptor 15b at the other end.

In general, Barnett discloses that the backbone pieces representing the sugar-phosphate components of the individual nucleotides can be assembled in any order with the male prong of one fitting the female receptor of the other. The male prongs and the female receptors disclosed by Barnett include cylindrical male prongs and cylindrical female receptors. As a result, as the segments 12 are assembled together to build one of the helixes 10 or 11, each segment 12 can rotate 360° axially with respect to an adjacent segment 12. For example, the segment 12b shown in Figure 5 can be rotated 360° axially relative to the segment 12a shown in Figure 4 via the connection between the male prong 14a and the female receptor 15b. Even if adjacent segments 12 have planar side groups 13 that inhibit complete 360° axial rotation with respect to one another, the segments 12 are still adapted to be interconnected in a wide range of orientations.

Thus, Barnett does not disclose, teach, or suggest "at least one of the first elongated strand and the second elongated strand including a first segment and a second segment, the first segment and the second segment adapted to be interconnected in a single orientation," as specified by amended Claim 1.

Accordingly, Applicants respectfully submit that independent Claim 1 and dependent Claims 3-13 and 15-17 are allowable.

Dependent Claims 3-4

Claims 3-4 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Barnett in view of Pharos (European Patent Application Publication No. EP 0691194). Claims 3-4 depend from Claim 1 and are therefore allowable for the reasons set forth above with respect to Claim 1. Claims 3-4 may include additional patentable subject matter not specifically discussed herein.

Dependent Claims 5, 12 and 13

Claims 5, 12 and 13 stand rejected under 35 U.S.C. §102(b) as being anticipated by Barnett. Claims 5, 12 and 13 depend from Claim 1 and are therefore allowable for the reasons set forth above with respect to Claim 1. Claims 5, 12 and 13 may include additional patentable subject matter not specifically discussed herein.

Dependent Claims 6-8, 16 and 17

Claims 6-8, 16 and 17 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Barnett in view of Rubin. Claims 6-8, 16 and 17 depend from Claim 1 and are therefore allowable for the reasons set forth above with respect to Claim 1. Claims 6-8, 16 and 17 may include additional patentable subject matter not specifically discussed herein.

Dependent Claims 9-11

Claims 9-11 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Barnett in view of Rubin, and further in view of Clarke (U.S. Patent No. 3,939,581). Claims 9-11 depend from Claim 1 and are therefore allowable for the reasons set forth above with respect to Claim 1. Claims 9-11 may include additional patentable subject matter not specifically discussed herein.

Dependent Claim 15

Claim 15 stands rejected under 35 U.S.C. §103(a) as being unpatentable over Barnett in view of Dingman (U.S. Patent No. 3,854,223). Claim 15 depends from Claim 1 and is therefore

allowable for the reasons set forth above with respect to Claim 1. Claim 15 may contain additional patentable subject matter not specifically discussed herein.

Independent Claim 18

Claim 18 stands rejected under 35 U.S.C. §102(b) as being anticipated by Rubin (Rubin, B. and Richardson, J.S., "The simple construction of protein alpha-carbon models," Biopolymers 11, 2381-2385 (1972)).

Amended Claim 18 calls for, among other things:

> "...a first elongated tubular strand ...the first elongated tubular strand including at least two first strand segments, the at least two first strand segments adapted to be interconnected in a single orientation" (amendment marks not shown; underlining added for emphasis).

Rubin discloses a method for the rapid construction of protein alpha-carbon models from a continuous length of metal rod. Specifically, the fourth paragraph on page 2381 states that, "[t]he backbone models described below and illustrated in Figure 1 and 2 are each made by forming a single piece of rod" (emphasis added).

Thus, Rubin does not disclose, teach, or suggest a "first elongated tubular strand including at least two first strand segments, the at least two first strand segments adapted to be interconnected in a single orientation," as specified by amended Claim 18. Accordingly, Applicants respectfully submit that independent Claim 18 and dependent Claims 19-20, 22-29, and 31-35 are allowable.

Independent Claims 18 and 36

Claims 18 and 36 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Barnett in view of Rubin.

Amended Claim 18 calls for, among other things:

"...a first elongated tubular strand...the first elongated tubular strand including at least two first strand segments, the at least two first strand segments adapted to be interconnected in a single orientation" (amendment marks not shown; underlining added for emphasis).

Amended Claim 36 calls for, among other things:

"...at least one of the first elongated strand and the second elongated strand including a first segment and a second segment, the first segment and the second segment adapted to be interconnected in a single orientation" (amendment marks not shown; underlining added for emphasis).

Barnett teaches a model for representing nucleic acid molecules, such as deoxyribonucleic acid (DNA) and ribonucleic acid (RNA), which consists of a plurality of helical segments secured together in end-to-end relation in the form of one or two helixes comprising the molecular backbone. As shown in Figures 4 and 5 of Barnett, the segment 12a can be connected to the segment 12b by inserting the male prong 14a into the female receptor 14b. Because of this type of interconnection, each segment 12a or 12b can be axially rotated 360° with respect to one another, allowing the segments 12a and 12b to be interconnected in many possible orientations.

Rubin does not cure the deficiencies of Barnett. Rubin teaches protein backbone models made by forming a single piece of metal rod. The single piece of metal rod does not include any segments.

Thus, Barnett and Rubin, either alone or in combination, do not teach or suggest "the at least two first strand segments adapted to be interconnected in a single orientation," as specified by amended Claim 18, or "the first segment and the second segment adapted to be interconnected in a single orientation," as specified by amended Claim 36. Accordingly, Applicants respectfully submit that independent Claim 18, dependent Claims 19-29 and 31-35, independent Claim 36, and dependent Claims 37-46 and 48-50 are allowable.

Dependent Claims 19-20, 22-23, 27-29, 34-35, 40-41, 45-46, and 49-50

Claims 19-20, 22-23, 27-29, 34-35, 40-41, 45-46, and 49-50 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Barnett in view of Rubin. Claims 19, 20, 22, 23, 27-29, 34 and 35 depend from Claim 18 and are therefore allowable for the reasons set forth above with respect to Claim 18. Claims 40-41, 45-46, and 49-50 depend from Claim 36 and are therefore allowable for the reasons set forth above with respect to Claim 36. Claims 19-20, 22-23, 27-29, 34-35, 40-41, 45-46, and 49-50 may include additional patentable subject matter not specifically discussed herein.

Dependent Claims 21, 32, 33, and 38-39

Claims 21, 32, 33, and 38-39 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Barnett in view of Rubin, and further in view of Pharos. Claims 21, 32, and 33 depend from Claim 18 and are therefore allowable for the reasons set forth above with respect to Claim 18. Claim 38-39 depend from Claim 36 and are therefore allowable for the reasons set forth above with respect to Claim 36. Claims 21, 32, 33, and 38-39 may include additional patentable subject matter not specifically discussed herein.

Dependent Claims 31 and 48

Claims 31 and 48 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Barnett in view of Rubin, and further in view of Dingman. Claims 31 and 48 depend from Claims 18 and 36, respectively, and are therefore allowable for the reasons set forth above with

respect to Claims 18 and 36. Claims 31 and 48 may include additional patentable subject matter not specifically discussed herein.

Dependent Claims 24-26 and 42-44

Claims 24-26 and 42-44 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Barnett in view of Rubin, and further in view of Clarke. Claims 24-26 and 42-44 depend from Claims 18 and 36, respectively, and are therefore allowable for the reasons set forth above with respect to Claims 18 and 36. Claims 24-26 and 42-44 may include additional patentable subject matter not specifically discussed herein.

Independent Claim 51

Claim 51 stands rejected under 35 U.S.C. §103(a) as being unpatentable over Barnett in view of Rubin, and further in view of Clarke.

Amended Claim 51 calls for, among other things:

> "...a plurality of amino acid backbone units adapted to be removably coupled to one another in one of two orientations..." (amendment marks not shown; underlining added for emphasis).

As discussed above, Barnett teaches a model for representing nucleic acid molecules, such as deoxyribonucleic acid (DNA) and ribonucleic acid (RNA), which consists of a plurality of helical segments secured together in end-to-end relation in the form of one or two helixes comprising the molecular backbone. As shown in Figures 4 and 5 of Barnett, the segment 12a can be connected to the segment 12b by inserting the male prong 14a into the female receptor 14b. Because of this type of interconnection, each segment 12a or 12b can be axially rotated 360° with respect to one another, allowing the segments 12a and 12b to be interconnected in many possible orientations.

Rubin does not cure the deficiencies of Barnett. Rubin teaches protein backbone models made by forming a single piece of metal rod. The single piece of metal rod does not include any segments.

Clarke does not cure the deficiencies of Barnett and Rubin. Clarke teaches a color-coded molecular model assembly kit comprising two basic and complementary construction units capable of being interlocked. *See Clarke*, abstract. Clarke teaches forming peptide units, such as those shown in Figures 9 and 10, by connecting various coupling means (for example, 30b of Figure 10) and connecting tubes (for example, 50a, 50b, 50j, 50k, etc. of Figure 10). *Id.* at col. 8, lines 7-24. Clarke also teaches connecting two peptide units "in such a manner that the nitrogen-hydrogen bond 50k of FIG. 10 is trans and planar to the carbonyl group 50c of FIG. 9 as shown in FIG. 6." *Id.* at col. 8, lines 62-65. Clarke teaches that this connection "is achieved by inserting the arm 11 of the amine group of FIG. 10 into the tube 50c of the peptide unit of FIG. 9 and pressing it into place in proper position." *Id.* at col. 8, lines 63-68 (emphasis added). In addition, Clarke teaches that that "[t]he desired angle 22 is obtained by rotating the carbonyl carbon coupling means 30b about the connecting tube 50i with the tube 50i attached loosely to the arm of 30a. The tube 50i is then pressed firmly onto the arm of 30a to fix the angle permanently." *Id.* at col. 8, lines 38-43. From this description, one of ordinary skill in the art would understand that the tube 50c can be rotated about the arm 11 loosely and in many possible orientations until properly positioned.

Thus, Barnett, Rubin, and Clarke, either alone or in combination, do not teach or suggest "a plurality of amino acid backbone units adapted to be removably coupled to one another in one of two orientations," as specified by amended Claim 51. Accordingly, Applicants respectfully submit that independent Claim 51 and dependent Claims 52-53 and 55-72 are allowable.

Dependent Claims 53 and 62-72

Claims 53 and 62-72 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Barnett in view of Rubin, and further in view of Clarke. Claims 53 and 62-72 depend from

Claim 51 and are therefore allowable for the reasons set forth above with respect to Claim 51. Claims 53 and 62-72 may include additional patentable subject matter not specifically discussed herein.

NEW CLAIMS AND ALLOWABLE SUBJECT MATTER

Applicants appreciate the Examiner's indication that Claims 14, 30, 47 and 54-61 include allowable subject matter. New Claims 103, 104, 105 and 106 include the subject matter of original Claims 14, 30, 47 and 54, respectively, and have been rewritten in independent form to include all of the limitations of the base claim and any intervening claims. Applicants respectfully submit that new Claims 103-106 are in condition for allowance.

CONCLUSION

In view of the above, Applicants respectfully request entry of the Amendment and allowance of pending Claims 1, 3-13, 15-20, 22-29, 31-36, 38-46, 48-53, 55-72 and 103-106.

Respectfully submitted,

Raye L. Daugherty
Reg. No. 47,933

File No. 66182-9016-01
Michael Best & Friedrich LLP
100 East Wisconsin Avenue
Milwaukee, Wisconsin 53202-4108
(414) 271-6560